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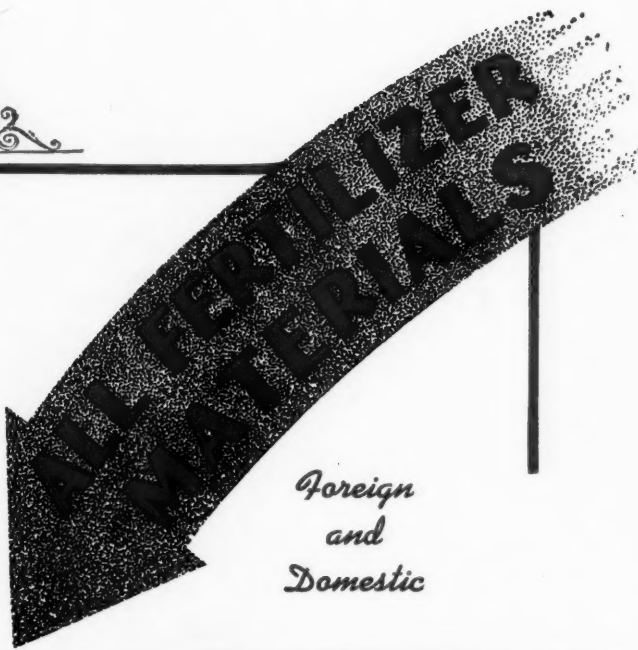


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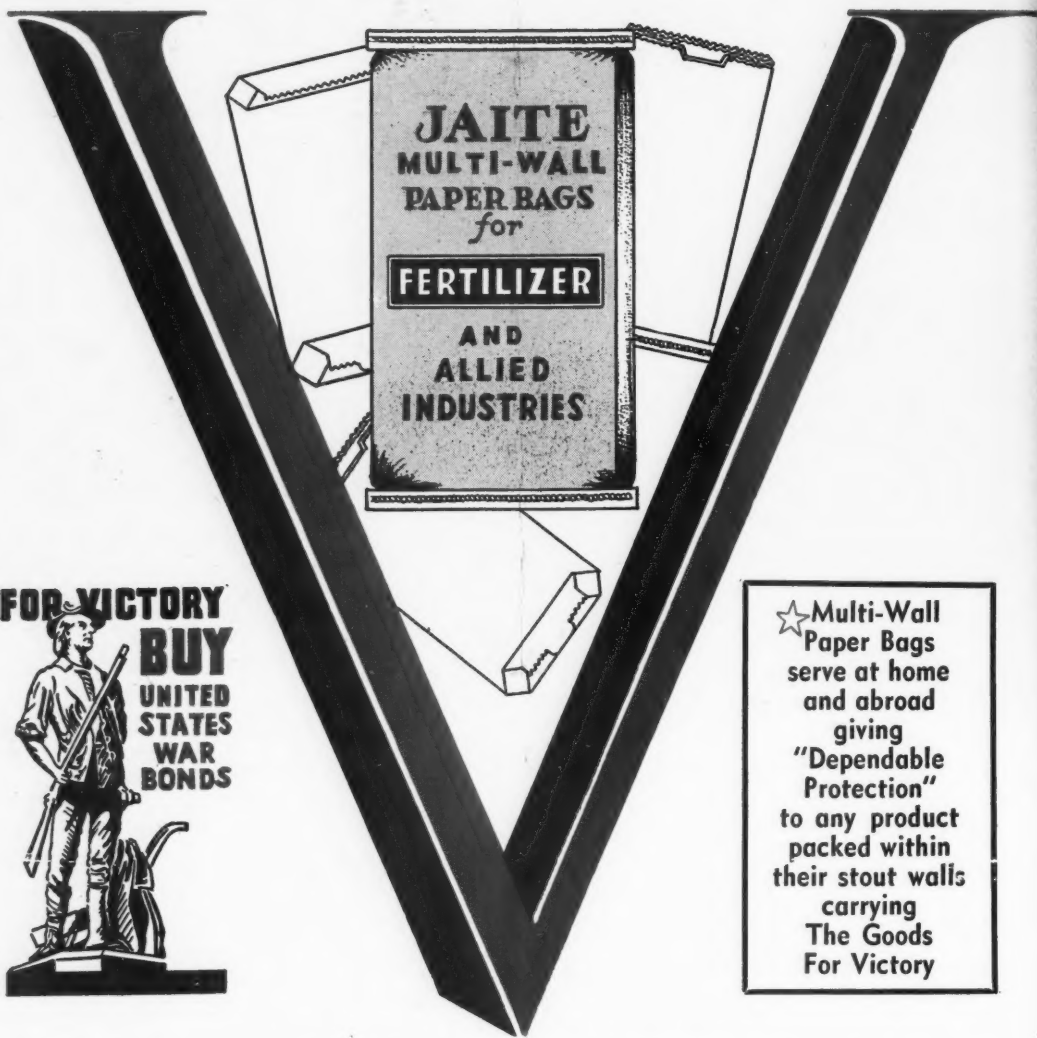
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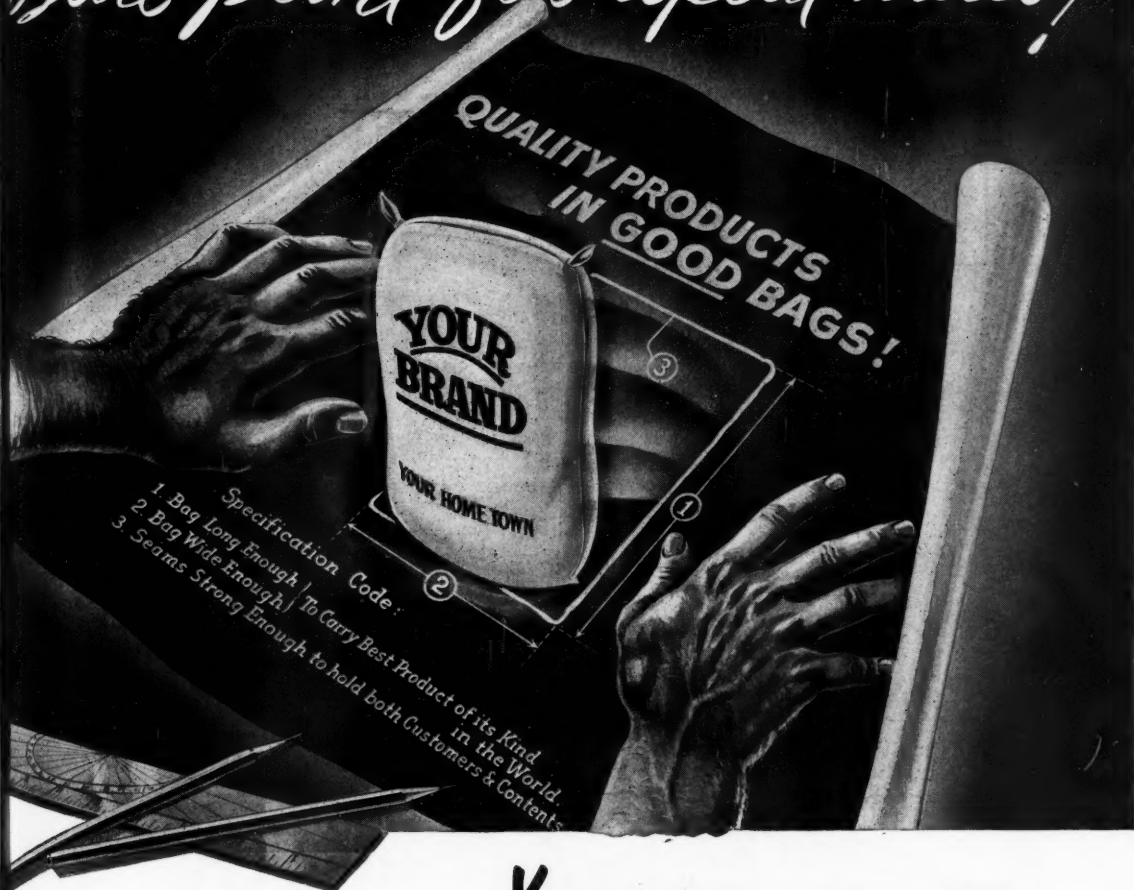
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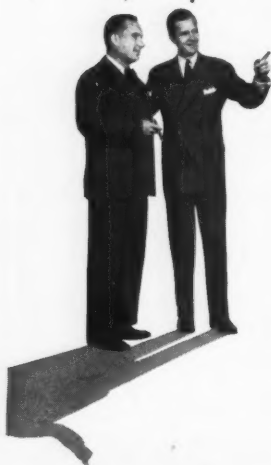
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"That man is a benefactor to his race who makes two blades of grass to grow where but one grew before."

Vol. 103

OCTOBER 20, 1945

No. 8

What About Plow-Sole Fertilizing?

By C. J. CHAPMAN

Soils Department, College of Agriculture, Madison, Wisconsin

THERE is a growing interest in this so-called plow-sole or furrow bottom method of fertilizer application. Many farmers, however, are asking the question, "Why not apply the fertilizer broadcast or plow it under?" Others are asking, "Is it all right to apply fertilizer when we do our fall plowing with an attachment on the plow?" We also hear the question, "Why use an 8-8-8 or 6-6-18 mixture containing so much nitrogen?" The most pertinent question, however, which farmers are asking is, "Will it pay to use from 600 to 1,000 pounds per acre of these high powered fertilizers?"

I will try and answer some of these questions: At the outset let me point out that where large amounts of commercial plant food are being used, it is desirable to get this fertilizer down a good six to eight inches in the soil where the feeding roots of your crop are best able to make use of this plant food during drought periods in July and August. We all know that plant food, in order to be available to growing crops, must be in water-soluble form and certainly we know that during periods of drought this water-soluble plant food must be derived and brought up from the lower root feeding zone. The placement of fertilizer down on the plow-sole at the depth of from five to eight inches in concentrated bands, I believe, is a sound and practical idea.

The question of whether to apply broadcast or plow under or apply with an attachment on the plow and place in bands on the plow-sole may be answered by this quotation from the weekly news service of the United States Department of Agriculture dated

October 11, 1944. "Placing fertilizer at the bottom of the plow furrow at the time of turning the soil is a promising method for some crops according to the U. S. Department of Agriculture. Tests of the method during the past crop season by engineers of the Agricultural Research Administration gave good results in fields later planted to tomatoes, potatoes and cabbage. The good results are attributed to the fact that even in dry weather the soil at this depth is likely to be damp enough to make the plant food available to the roots of the crop. Placement of fertilizer in bands is beginning to show better yields than broadcasting on cropping crops in western Washington. For some crops, particularly the deep rooted beets and carrots, placing fertilizer four and five inches below the seed was better than side placement." Experimental work at Purdue University in Indiana has shown increases of as much as 13 bushels more corn per acre where the same amount of 8-8-8 fertilizer was placed in bands on the plow-sole as compared to the broadcast plow-under method. I do not have time to go into details in explaining the reason for these superior results, but it is sufficient to say that there is less fixation of phosphate where applied in concentrated bands on the plow furrow as compared to broadcasting and plowing under. Furthermore, nitrogen contained in the fertilizer mixture is held in a form which does not readily come to the surface with capillary moisture and is therefore held at this lower level and available to the growing crop at a later period when it is needed.

The question, "Why use the high powered 8-8-8 or 6-6-18 mixtures with so much nitro-

gen?" may be answered in the following statement. First of all, permit me to say that for corn on the average farm this plow-sole method of fertilizer application is recommended on those fields where little or no manure is available and where the level of fertility of the field is low. Here, of course, we are simply using a commercial fertilizer as a substitute for manure. On average highland fields, therefore, this 8-8-8 mixture for corn actually supplies the plant food in about the ratio in which the crop requires these nutrient elements (with some additional phosphate). It is true that on the darker colored bottom land soils a fertilizer containing relatively less nitrogen and more potash should be used. However, on the lighter colored silt or clay loam soils and more especially on the light colored sandy soils, nitrogen is the element that most often limits the growth of crops. Bear in mind the fact that manure is relatively rich in nitrogen. A ton of manure contains about ten pounds of nitrogen, from four to six pounds of phosphoric acid and from ten to twelve pounds of potash. In other words the thing we are doing when we apply 800 pounds of an 8-8-8 per acre is simply substituting about the same amount of plant food that is contained in six loads of good manure, plus a little additional phosphate. Of course for such special crops as potatoes, tomatoes, tobacco, sugar beets, cabbage, carrots, etc., we do need a fertilizer which contains relatively more potash and here the 6-6-18 seems to be a good mixture to use for these truck crops where applied by the plow-sole method.

Rate of Application

The question as to whether or not it will pay to use from 600 to 1,000 pounds per acre of fertilizer must, of course, be answered by the individual farmer. An application of, let us say, 700 or 800 pounds per acre of an 8-8-8 will cost in the neighborhood of \$15. Bear in mind, however, that where these heavy applications of fertilizer are made there will be a good residual carry-over benefit to succeeding crops. We feel that it is unfair to charge more than about 60 per cent of the cost of the fertilizer against the first year's crop.

For fields on the average farm where from 200 to 300 pounds per acre of a phosphate-potash fertilizer such as 0-20-10 or 0-20-20 is applied at the time of seeding down and where corn is grown in rotation and where stable manure is used and where legume sod is plowed down—where all of these conditions

are met, I do not recommend plow-sole fertilizers. Here the small application of from 100 to 150 pounds per acre of a fertilizer with an attachment on the planter is all that is needed. However, we know that on many, many farms there are occasional fields where manure is not available. And on such fields where you plan to plant corn, we are recommending from 600 to 800 pounds per acre of 8-8-8 fertilizer by the plow-sole method. Hundreds of demonstrations have shown that it is possible to increase yields of corn from 15 to 30 bushels per acre on these low fertility fields.

Statistics show that the average yield of corn for 1944 in Wisconsin was 43 bushels per acre. While that is a pretty good average, yet we know this figure includes thousands of acres of corn that made yields of 20, 25 and 30 bushels per acre. It is true that there were many thousands of acres that made 75, 80 and 90 bushels per acre. It is my belief that even this year, if every acre of corn had been adequately supplied with all of the plant food nutrients it could have made use of, our yields might have averaged around the 65 bushel mark.

In summary, let me say that crops which make their growth over a relatively long period of time, crops which have a high per acre value, crops which develop an extensive and deep feeding root system and those crops which are known to require large amounts of plant food—these are the crops which will lend themselves best and most profitably to this method of fertilizer application.

It is perfectly safe to apply your fertilizer when doing your fall plowing. In fact, many farmers prefer to apply their fertilizer in the fall when time is not such an important factor as is usually the case in the spring. We have made some comparisons of fall vs. spring application and have had just as good results where applied in the fall. I would, however, hesitate to plow under high nitrogen fertilizers on very sandy soils since there might be some danger of losing part of the soluble nitrogen by leaching before growing crops occupy the field next year.

Barrett Promotes Donald

Leroy Donald, Goodman, Mississippi, has been appointed Chief Agronomist, Sales Agency Department of The Barrett Division, Allied Chemical & Dye Corporation, it has been announced by Barrett officials. Mr. Donald was formerly Southern Agronomist for the same corporation.

We're Learning More About the Soils of New Jersey*

SOIL, like faith, is the substance of things not seen. Other than mankind itself, it is the most important resource of the State and Nation. Field surveys of the soil and careful studies of the means by which it can best be conserved are essential to public welfare. Such surveys, and the supplemental studies associated therewith, cannot be completed in a year, or even a century, but must be continuous. For soil changes with time and use, and the intensity of its use increases with the growth of population. Before the white man discovered the United States, only about 800,000 Indians roamed its forests and prairies. Now our soil must provide for 170 times that many people, to say nothing of the food shipments required to be sent abroad.

Erosion Threatens New Jersey Soils

The need for soil conservation in New Jersey is apparent from the deep gullies that have developed in many cultivated fields where inadequate measures have been employed in erosion control. But many of the evils of erosion are not so readily apparent to the eye. Exact measurements of erosion effects and of the resulting reduction in productivity are being made, therefore, at the Marlboro Soil Conservation Experiment Station. Soil losses under continuous cultivation of the land amounted to 8,900 pounds per acre annually, in comparison with an average loss of only 4,200 pounds when a hay crop was introduced once in three years. The productivity of land was found to be closely correlated with the amount of the original topsoil still remaining in place.

Among the many methods that are employed to control erosion, those designed to maintain a high level of organic matter in the soil are receiving special attention. A large number of field tests are being made in southern New Jersey of the effect of resting the land by growing soil-improving crops for a whole year for plowing under,

by the use of winter cover and catch crops, and by the application of hauled-in material, such as sawdust and salt hay.

Organic Materials Tested

In a comparison of 24 different organic materials that are being used at the rate of $2\frac{1}{2}$ tons dry weight per acre annually in conjunction with 1,000 pounds of 5-10-10 fertilizer in the growing of snapbeans, it was found that cultivated peat, peat moss, and cornstalks were the most effective, and pine shavings and salt hay the least. Bean yields were greatly reduced following the growing of sweet clover, no matter whether the roots alone or the entire crop was plowed under. The yield of snapbeans was nearly ten times as large following the plowing under of mixed weeds as after a pure stand of sorrel. The evidence indicates that these bad effects are the result of the presence of some toxic substance in these materials, either naturally or as a result of their decomposition in the soil. Resins, coumarin, and oxalic acid are believed to be the responsible agents in the shavings, sweet clover, and sorrel, respectively. Other studies indicated that salt hay contains so much common salt as to make its use objectionable under some conditions. The answer to this difficulty lies in exposing the hay to the leaching action of the rain for some weeks before it is used.

Analyses of sewage sludges indicated an average content, on an oven-dry basis, of around 1.5 per cent nitrogen, 1.5 to 2.0 per cent phosphoric acid, and 0.2 to 0.3 per cent potash. Their contents of dry matter, on the wet basis, vary between 15 and 45 per cent, and their pH values lie between 6.5 and 7.5. Used at the rate of 10 tons per acre on the corn crop, sludge has been found to be about as effective as an equal amount of cow manure.

Synthetic Manure

In a study of the production of composts from various types of plant materials, it was found that a high-quality artificial

*From the Annual Report of the New Jersey Agricultural Experiment Station, Rutgers University, New Brunswick, N. J.

manure comparable to composted cow manure can be prepared from cornstalks within a period of 3 months. Good-quality products were prepared within 4 to 6 months from cereal straw. Resistant materials, such as salt-grass hay and woody residues, required much longer periods for proper decomposition. Tree and shrub trimmings and other woody materials should not be mixed with ordinary plant refuse because of the slowness with which they decompose. Such products should be built into a special manure pile and allowed to decompose for a longer time. Composts from peat and leaves should be considered only as soil conditioners. They will, however, make high-quality manures if reinforced with inorganic fertilizer. The residual effect of the composts produced from cow manure, cornstalks, and cereal straw was much greater than that of inorganic fertilizer. These results were checked both by greenhouse and field tests.

Vitamins in Composted Materials

Many plant materials are attacked by microorganisms. This is particularly the case with those which are added to the soil, but applies as well to certain animal feeds such as silage and materials used as human foods like sauerkraut and cheese. It can be expected that the vitamin content of these materials will become altered as a result of microbial development, in the light of results recently obtained in the microbiology laboratories. Three of the B-vitamins, riboflavin, pantothenic acid, and nicotinic acid were included in the study.

Vitamins Soon Lost

In some cases there was an increase in the vitamin content of the decomposed material during the first few days of decomposition. The percentage increases were greater with vitamin-poor materials such as straw than with other materials like grass which had a relatively high initial vitamin content. After the brief period of initial increase in the amounts of vitamins, there was a loss and in many cases the rate of loss was more rapid than decomposition of the organic material as a whole. Consequently, the final composted product had a lower vitamin content than the plant material from which the compost was prepared.

It has been established that plants are able to absorb vitamins through their root systems, but it remains to be determined whether or not appreciable amounts of vitamins are absorbed and, if so, whether these produce superior plants. In any case

the results indicate that one should not expect composted material to be richer in vitamins than fresh plant residues and it seems unlikely, therefore, that benefits obtained from treatment of soil with composts are due to any appreciable extent to the vitamins contained in them.

Fitting Fertilizer Practice to the Soil

In general, all New Jersey soils when put to intensive use have been found to require liberal applications of complete fertilizer. On the heavier types most or all of the fertilizer can be applied a few days in advance of planting or along the row at planting time. On the sandier types, however, better results were obtained by smaller applications frequently repeated during the growing season. The problem is one of storage, the sands having much less "exchange" capacity for fertilizer elements than the loams.

Virtually all the nonlimestone soils of the state have been shown to be naturally acid and in need of lime, once they are put into production. Those of limestone and calcareous-shale origin, such as the Hagerstown and Dutchess, were found to contain an abundance of lime in their subsoils, and, for that reason, are better suited to such deep-rooted, acid-sensitive perennials as alfalfa, than are those derived from non-calcareous rocks. This is on the assumption that their subsoils are well drained, as indicated by a yellow, red, or brownish color.

Potassium Studies

The potassium needs of 20 important New Jersey soils have been intensively studied. It was found that Lakewood sand, Whippany silty clay loam, Sassafra sand, Gloucester loam, and Papakating stony loam had the greatest need for this element, and Dutchess shale loam, Bermudian silt loam, Dover loam, Penn silt loam, and Collington loam the least, the other 10 soils being intermediate in their potassium requirements.

Studies of the mineral composition of alfalfa in relation to the soil on which it was grown showed that on soils that are high in available potassium this crop may absorb three or four times as much of this element as it needs, its content of calcium and magnesium being correspondingly reduced. This points to the need of heavy applications of lime in preparation for the crop and annual applications of potassium as required. Otherwise there is a waste of the relatively costly potassium. Furthermore, when the alfalfa takes up large amounts

of potassium at the expense of calcium, its mineral-feed value is greatly reduced, the calcium requirements of animals being high whereas their need for potassium is low.

Boron Findings

Considerable attention was paid to the trace elements, deficiencies of which are becoming more and more serious as the soils grow older agriculturally and as the economic need for higher acre yields increases. This boron, an element that is required in such small quantities that deficiencies in it were unknown until recently, was found to be deficient in 12 per cent of the soils of the state, and considerable amounts of borax, the primary source of this element, are now being used, especially for such crops as alfalfa, turnips, beets, radishes, and cauliflower.

Since this survey was completed the question has frequently been raised as to whether or not the fertilizer practices or the liming practices on the agricultural soils of the state in any way influence the effectiveness of boron in supplying the needs of the plants. Through careful investigation by the use of controlled plant cultures at the Experiment Station, and supplementary observations in the field, the answer to this question is now available.

Careful study of tomatoes and corn grown in boron-deficient media (solution, sand, and soil culture) has demonstrated the fact that injury to the plants due to boron deficiency is much less severe at low levels of potassium than at high levels in the same medium. Injury is particularly severe when more potassium is present than is required for good growth. Calcium acts in the same way as potassium in this respect except that it is more effective than potassium in its capacity to intensify the symptoms of boron deficiency. Low boron with high calcium appears to be a deadly combination.

Injury to plants resulting from too much boron in the growth medium is also much more severe at high potassium levels than it is at low potassium levels. On the other hand, calcium has just the opposite effect. Boron toxicity is much more severe at low than at high calcium levels.

From Laboratory to Field

The practical aspects of these results may be stated briefly and in very simple terms as follows: If a soil is so deficient in boron that visible symptoms of deficiency occur on the plants grown on the soil, the application of potassium would tend strongly to intensify the injury to the plants already

suffering from boron deficiency. The application of lime to this same boron-deficient soil would unquestionably magnify the injury sustained by the plants, the degree of injury depending upon the size of the application. These results have been observed both in the field and in artificial culture under controlled experimental conditions.

Would Intensify Injury

At the other extreme, if an agricultural soil has a boron content in excess of that required for good growth and development, so that visible symptoms of toxicity occur on the plants, the application of potassium would intensify the injury to the plants already suffering from boron toxicity, particularly if the quantity of potash applied should be in excess of that required for maximum yields. If, on the other hand, lime should be applied to this same soil, the injury sustained by the plants would be diminished and might be completely overcome, depending upon the size of the application of lime. These results also have been obtained in experimental cultures and observed in the field.

Another important fact relative to boron metabolism and boron relationships in different plants has been brought out by these studies. Whereas the potassium-boron and calcium-boron relationships are similar in all plants thus far investigated, it has become clear that the levels (concentrations) of the nutrient elements in question at which these interrelationships manifest themselves through visible injury to the plants, are markedly different for the two great classes of plants, the *dicotyledonous* (tomatoes, alfalfa, beets, beans, potatoes, etc.) and the *monocotyledonous* (corn, wheat, rye, oats, barley, grasses, etc.). Furthermore, there is a sharp line of distinction between these two great classes of plants with respect to their minimum boron requirements and their ability to endure excesses of this element. The *dicot* (tomato, alfalfa, etc.) has a very high minimum boron requirement and a very low resistance to excess boron as compared with the low minimum requirement and the very high resistance to excess boron of the *monocot* (corn, wheat, etc.). For example, corn will grow normally on a soil in which the boron content is totally inadequate for the growth of the tomato and other dicots. On the other hand, corn will also grow without injury on a soil which may contain enough boron to destroy the tomato plant.

(Continued on page 28)

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Trend Toward Mechanized Farming

A recent survey of the United States Department of Agriculture indicates the intention of one out of every four farmers to buy a farm tractor. In like degree they are planning to invest in other labor-saving machinery. Wartime scarcity of labor has, of course, accentuated this trend.

The natural consequence of mechanized farming is more cultivated acres per farm since many farm operations are limited to too few acres for the efficient use of labor-saving machinery.

Though labor-saving is the first consideration, often the chief contribution of mechanical power farming is in time-saving. The job is done quicker by machines, which may mean that crops may be planted on time when slower methods would delay plantings. Likewise cultivation periods between rains could be utilized more effectively.

Perhaps there is some ground for a fear that mechanical farming may lead to more acres with less thought given to more crops per acre, that there will be a temptation to use the machines to expand the production of cash crops to the point of creating depressing surpluses.

Some mistakes will be made with the new productive power, but if not at first, then certainly later on, it will be realized that more acres can mean most when each acre is used to grow a maximum yield, and that a well-balanced farming program is best and can be made more profitable by using farm machinery to support it.

With rural electrification, community freezing-lockers and processing plants, local marketing and grading organizations, good roads to markets, agriculture is undergoing revolutionary developments. Power farming is only one phase.

But none of these can halt the need of plant food to replace that carried away in farm crops and livestock sold off of the farm, nor of that which is eroded or leached from the soil each year. The producer and seller of plant food can be affected only by the success or failure of the consumer. Of course, the manufacturer wants the consumer to succeed so that he will continue to be a good customer. Therefore, safe guidance of farmers in their purchase and use of mechanical, labor-saving machinery and in other measures adding to the efficiency of well-balanced farm programs, is of no small concern to the fertilizer manufacturer.

New Ceiling on Tennessee Phosphate Rock

An increase of 20 cents a ton in the ceiling for sales of all grades of Tennessee phosphate rock by producers to fertilizer manufacturers was announced by the Office of Price Administration on October 9th.

As manufacturers will be required to absorb the increase, the price of fertilizer to the farmer will not be affected, said OPA.

The increase, effective October 15, 1945, will amount to the approximate cost to the industry of a recent increase in wages for labor engaged in mining and processing Tennessee phosphate rock. The wage increase was ordered by the War Labor Board. The amount of the increase is considered the minimum requirement to keep all essential producers in operation, OPA said.

Phosphate rock is essential for the manufacture of fertilizer needed to meet food production goals set by the Department of Agriculture, OPA explained.

Two changes affecting only producers of Florida pebble phosphate rock are also included in the current amendment. They are:

(1) The same adjustments that have been customary to provide for excess amounts of iron oxide, alumina and moisture in Tennessee phosphate rock are also provided for Florida pebble phosphate rock.

(2) The same addition of 40 cents a net ton for bagging in valve bags provided by the buyer will be permitted producers of Florida pebble phosphate rock that has been allowed buyers of Tennessee phosphate rock.

New Barrett Staff Appointments

The Barrett Division of the Allied Chemical and Die Corporation has announced the appointment of Roy S. Marsden, as Assistant Manager of its Sales Agency Department, with headquarters at New York. Mr. Marsden was formerly located at the Atlantic office of the Company.

Walter S. Colvin, formerly Sales Manager for the New York District has been appointed Sales Manager in charge of nitrate sales for the Northern District. He will be located at the New York Office.

Henry L. Taylor, former Chief of the Nitrogen Unit of the War Production Board, has joined the Barrett Division as assistant to W. H. Mortimer, who is in charge of sul-

phate of ammonia sales, with headquarters at New York.

Mr. Taylor has been with the Nitrogen Unit of the War Production Board, at Washington, D. C., for the past three years. Prior to going to Washington, he operated his own fertilizer brokerage business for many years in Wilmington, N. C., and is well known by the fertilizer trade.

Davies Joins Synthetic Nitrogen Products Organization

Announcement has been made by M. Tegtmeier, Executive Vice-President and Secretary of Synthetic Nitrogen Products Corporation, that Thomas W. Davies had joined their organization on October 1st. Mr. Davies will represent the company in South Carolina and will continue to make his home at 4100 Round Top Road, Columbia, S. C. He has had many years' experience in the fertilizer materials business and is widely known in the industry.

Government Offers Eight Ammonia Plants for Sale or Lease

The Reconstruction Finance Corporation is offering for sale or lease eight government-owned chemical plants which have been producing synthetic ammonia. These plants have a daily capacity of 1,840 tons of ammonia and 1,240 tons of ammonium nitrate in solution. The location of the plants, the companies who have operated them, and their daily capacity are as follows:

El Dorado, Ark., Lion Chemical Corp.: 300 tons of ammonia and 300 tons of ammonium nitrate in solution.

Lake Charles, La., Mathieson Alkali Works: 150 tons of ammonia and 240 tons of ammonium nitrate in solution.

Sterlington, La., Commercial Solvents Corp.: 150 tons of ammonia.

Henderson, Ky., Atmospheric Nitrogen Corp.: 150 tons of ammonia.

South Point, Ohio, Atmospheric Nitrogen Corp.: 300 tons of ammonia and 400 tons of ammonium nitrate in solution.

Morganville, W. Va., E. I. duPont de Nemours & Co., 340 tons of ammonia, 90,000 gals. of methanol, 130,000 lbs. of formaldehyde, 100,000 lbs. of hexamine.

Dumas, Texas, Shell Chemical Co.: 150 tons of ammonia.

Pittsburg, Kansas, Military Chemical Works: 300 tons of ammonia and 300 tons of ammonium nitrate in solution.

September Tax Tag Sales

The upward trend in fertilizer sales continued in September, with tag sales in that month 5 per cent greater than in September, 1944. Sales in each month of this year, with the exception of February, have been larger than in the corresponding month of last year.

Total sales in the reporting States in the first nine months of this year exceeded sales in January-September, 1944, by 10 per cent. Increases were registered by all of the States except Kansas, where a small decline was reported. The relatively greater increase in fertilizer tonnage in the Midwest than in the older fertilizer using regions in the East and South, which has been pronounced in recent years, has continued this year. The January-September increase in the five Midwestern States over last year was 17 per cent, compared with an 8 per cent rise in the South. In comparison with 1939, sales in the South were one-fourth larger this year while sales in the Midwest were more than double.

Tag sales in the 17 reporting States in the first three months of the current fertilizer year, July through September, represented a total of 951,000 tons, compared with 798,000 tons in the comparable period of 1944 and 716,000 tons in 1943.

Phosphate Fertilizers Increase Beef Production on World's Largest Ranch

Experiments underway on the King Ranch in Brooks County, Texas, since 1937 have shown the range forage in that area is deficient in phosphorus and also that breeding cattle when fed a phosphorus supplement showed marked improvement not only in weight and condition but in calf production as well.

A study to determine practical methods of supplying additional needed phosphorus to range breeding cows in Brooks County has been underway since July, 1941. Cooperating in these studies were R. J. Kleberg, Jr., of the King Ranch and officials of the U.S.D.A. and of the TVA.

The soil in the area consists of a fine loose sand about 30 inches deep underlain by a tight, gravelly, clay subsoil. There is no water erosion as all of the rainfall which averages about 23 inches annually percolates readily into the soil. This soil, however, if unduly disturbed, will drift and form sand dunes. The native vegetation in the area is decidedly deficient in phosphorus, and during dry years "creeps" is common among the

FERTILIZER TAX TAG SALES

STATE	SEPTEMBER				JANUARY-SEPTEMBER		
	1945 Tons	1944 Tons	1943 Tons	% of 1944	1945 Tons	1944 Tons	1943 Tons
Virginia.....	34,616	41,313	47,383	119	499,250	418,148	400,265
North Carolina.....	36,878	24,526	39,076	111	1,207,850	1,089,719	1,133,561
South Carolina.....	14,325	10,600	15,015	109	691,580	635,123	715,783
Georgia.....	22,075	16,808	17,674	105	929,848	883,669	894,503
Florida*.....	60,280	59,740	40,264	102	590,928	581,709	477,040
Alabama.....	16,300	14,450	8,650	114	649,100	571,850	631,700
Mississippi.....	3,350	16,150	8,500	103	333,057	322,814	387,544
Tennessee.....	5,042	10,439	12,700	108	247,227	229,519	205,353
Arkansas.....	1,800	4,600	4,300	102	110,200	108,083	161,275
Louisiana.....	75,050	66,200	33,500	103	207,486	200,920	178,688
Texas.....	21,630	20,105	15,823	108	174,915	162,349	146,950
Oklahoma.....	1,000	2,500	500	115	19,362	16,851	17,588
Total South.....	292,346	287,431	243,385	108	5,660,803	5,220,754	5,350,250
Indiana.....	34,423	17,459	22,460	115	382,040	333,547	379,990
Illinois.....	27,825	15,350	7,349	148	206,764	139,890	84,093
Kentucky.....	10,420	15,705	11,705	111	247,241	222,999	147,207
Missouri.....	10,400	19,364	12,786	110	145,366	132,602	88,046
Kansas.....	3,000	4,750	4,300	91	34,305	37,496	16,204
Total Midwest.....	86,068	72,628	58,600	117	1,015,716	866,534	715,540
Grand Total.....	378,414	360,059	301,985	110	6,676,519	6,087,288	6,065,790

*Revised by eliminating the tonnage of raw phosphate rock and liming materials for earlier periods.

breeding herds. A number of the suckling cows in the control group were "creepy" in the late summer and several, when down, were for a time unable to rise without assistance.

Several sources of phosphorus supply for breeding cows were used.

1. No mineral supplement was supplied for the controls. These produced 417-lb. calf weight per cow per year average for the first two calf crops.
2. The fertilized pasture received 200 lbs. of 47 per cent superphosphate per acre. These produced 514-lb. calf weight per cow per year average for the two years. This pasture, however, was approximately 50 per cent heavier stocked.
3. On another pasture the animals received bone meal, free access, the year round consuming an average of 48 lbs. annually per head. These produced 448-lb. calf weight per cow per year average for the two years.
4. The phosphorus supplement for the other group consisted of disodium phosphate in the drinking water to supply a minimum of $6\frac{1}{2}$ grams per head daily. These produced 494-lb. calf weight per cow average for the two years.

Each of the pastures contains 640 acres and with the exception of the one fertilized, are stocked at the rate of 15 acres per cow, the customary stocking rate of the King Ranch. The fertilized pasture is stocked at a rate of 10 acres per cow or 50 per cent above the regular stocking rate based on general pasture experience.—*Annual Report, Texas Agricultural Experiment Station.*

Fisher to Head Connecticut Chemistry Department

Dr. Harry J. Fisher, associate chemist at the Connecticut Agricultural Experiment Station, has been named acting head of the analytical chemistry department at the Station succeeding Dr. E. Monroe Bailey, retiring head, William L. Slate, director of the Station, has announced. Dr. Fisher's appointment was effective October 1st.

Dr. Fisher has been a member of the Station staff since 1921, when he joined the analytical chemistry department as assistant chemist. He was named associate chemist in 1943.

He is well known for his work on the methods of analysis of drugs, originating several new methods.

Value of Phosphates

Limited application of superphosphates to 12 different Texas soils in experimental pots made an average increased yield of 59 per cent in Bermuda grass, and also an average increase of 35 per cent in the phosphoric acid content of the grass.

Robert R. Lancaster, pasture specialist for the A. and M. College Extension Service, calculates these per centage increases from findings by Dr. J. F. Fudge and Dr. G. S. Fraps of the Texas Agricultural Experiment Station in experiments conducted at College Station. The two researchers also brought out that one large application of superphosphate is more effective than an equivalent amount in two applications. Accordingly, says Lancaster, superphosphate should be applied to be available to stimulate the growth of seedlings and develop them into strong, thrifty plants able to endure severe conditions.

Some of the soils were much more favorable to Bermuda grass than others, Lancaster adds. Superphosphate greatly increased either the yield or the percentage of phosphoric acid content of the grass, or both yield and percentage. The increases in yield were greater where the soils were more deficient in active phosphoric acid.

Small applications of superphosphate often produced large increases in yield, but only small increases in the mineral content of the grass. Higher rates applied made larger increases in both yield and mineral nutrient well above the minimum for range animals.

On Lufkin fine sandy loam, Bermuda, Johnson and Angleton grasses increased three fold. Rhodes grass under similar conditions multiplied its yield five fold on phosphated soil. A dozen other common pasture grasses doubled and trebled in yield. But where these yields were high in mineral content, increases in the grasses were not high.

Since the mineral strength in grasses, rather than growth, is the most important on many Texas pastures, the amount of superphosphate applied should be enough not only to increase the yield, but also to raise the mineral content above the minimum for range animals. Other information indicates the increased value of working superphosphate into the soil as it is applied.

These data are included in *Experiment Station Bulletin No. 672, "Value of Different Phosphates for Texas Soils and Grasses."*

NAM Protests Compulsory Licensing of Patents

American supremacy in invention and technological progress will be endangered by compulsory licensing of patents as set forth in several bills now pending in Congress, R. J. Dearborn, Chairman of the Committee on Patents of the National Association of Manufacturers, recently declared.

"This country's growth to the status of the world's greatest industrial nation has been due largely to its patent system," said Mr. Dearborn. "Compulsory licensing of patents would strike at the very fundamentals of the system. It would compel the holder of a patent to grant license to others to produce his invention and would, in effect, mean a sharing of inventions, which is foreign to our American way of life.

"By forcing an inventor to give up his exclusive rights before he has an opportunity to reap any reward, the full incentive which the patent system is intended to give would be largely removed.

"Furthermore, if the patent holder is forced to license to all who may apply, he will be unable to obtain risk capital for the commercialization of his invention. Investors are willing to exploit a promising invention largely because of the exclusive rights for seventeen years given an inventor by the grant of a patent.

"Compulsory licensing also would adversely influence research. There would be a tendency for inventors to keep their inventions secret, which would defeat the chief purpose of the patent laws—to encourage disclosure."

Special importance was attached to the third report of the National Patent Planning Commission, issued September 6th. This group, headed by Dr. Charles F. Kettering, stated its opposition to compulsory licensing

as follows: "That policy and practice would not only nullify the patent owner's proprietorship, but it would also discourage inventiveness and lessen the initiative of investors by exposing them to greater uncertainty and larger risks of the investment of capital requisite to the development and commercialization of new mechanisms and compositions."

Held Damaging to Small Business

Compulsory licensing would be most damaging to small business and independent inventors as it would destroy their strongest weapon of competition and would legitimize piracy of inventions, Mr. Dearborn stated. Particularly significant, he said, is the following in the report of the National Patent Planning Commission: "In the post-war era, inventions will be powerful aids to small enterprises, both as to the products and the means of manufacture. Many of such lesser producers owe both their existence and their continuance to patented mechanisms and compositions. If they were obliged to license to others—including their largest rivals—the use of the inventions covering their instrumentalities and their articles of manufacture, their status would be endangered and competition benefiting the public would likewise be hazarded. Even our greatest industries had small beginnings and their growth is surely not in itself a detriment to our national welfare."

During the last forty years more than thirty compulsory licensing bills have been introduced in Congress. Testimony in hearings on these bills has been overwhelming to the effect that it would be fatal to numerous small enterprises and that small business cannot prosper without the protection afforded by the exclusive right granted by the patent laws.

(Continued on page 26)

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FERTILIZER MATERIALS MARKET

NEW YORK

Marked Drop in Steel Production Presages Shortage of Sulphate of Ammonia. Superphosphate Production Is Increasing and Will Soon Catch Up with Demand. No Extra Supplies of Potash Expected for Current Season.

Exclusive Correspondence to "The American Fertilizer"

NEW YORK, October 18, 1945.

Sulphate of Ammonia

With steel mills operating at about 66 per cent of capacity, a further drop in sulphate of ammonia production is expected. Contract shipments are taking practically the entire production and no stocks are accumulating. Market continues tight with no supplies to fill export demand which is accumulating.

Nitrate of Soda

There has been no change in the nitrate of soda situation. Only normal seasonal demands are being encountered and stocks are adequate to take care of all shipments promptly.

Organic Materials

Demand in all lines of organic materials is still outrunning the very short supplies. The expected increase in meat production has not materialized as yet. The menhaden catch on the Eastern Seaboard has been favorable but is going to fill earlier contracts.

Phosphate Rock

Shipments to acidulators are continuing at high levels. Most high grade rock production has been contracted for and export shipments are feeling the effects of increased domestic demands. An increase of 20 cents per ton on Tennessee rock has been granted by OPA, but fertilizer manufacturers are required to absorb this added cost without increasing their prices on superphosphate and mixed goods.

Superphosphate

There has been some slackening of demand from the eastern and southern sections, but business in the middle west continues brisk. Shipments on contracts are continuing in volume and the labor shortage is showing signs of improvement.

Potash

Production is continuing at high levels but contracts placed in the summer will take en-

tire production until next spring. Some fertilizer manufacturers would like to increase their orders but no additional supplies are likely to be available.

CHICAGO

Fertilizer Organics Still in Extremely Tight Position. Feed Materials Scarce and Ceiling Prices Prevail.

Exclusive Correspondence to "The American Fertilizer"

CHICAGO, October 15, 1945.

No improvement in supplies of organics appears imminent, and unless the situation does become better the shortage will be a decided handicap to fertilizer manufacturers. Demand is growing while producers are unable to make offerings.

In the feed market offerings of tankage are extremely scarce. Material is eagerly sought at full ceiling prices.

Ceiling prices are:

High grade ground fertilizer tankage, \$3.85 to \$4.00 (\$4.68 to \$4.86 per unit N) and 10 cents; standard grades crushed feeding tankage, \$5.53 per unit ammonia (\$6.72 per unit N); blood, \$5.53 (\$6.72 per unit N); dry rendered tankage, \$1.25 per unit of protein, f.o. b. producing points.

PHILADELPHIA

Demand for Materials Continues Brisk but Organics Are in Very Short Supply. Output of Chemical Materials Seems Adequate.

Exclusive Correspondence to "The American Fertilizer"

PHILADELPHIA, October 16, 1945.

Demand for all fertilizer materials is brisk, and supplies are scarce. Organics have almost disappeared from the market, and whenever an odd lot of tankage or blood appears it is quickly snapped up.

Organic Ammoniates.—As stated, tankage and blood are extremely scarce, and when an odd lot does turn up, it most often goes to

(Continued on page 20)

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Chilean Nitrate Issues New Supplement to Minor Element Bibliography

The Chilean Nitrate Educational Bureau, Inc., announces publication of the Sixth Supplement to the Third Edition of the *Bibliography of References to the Literature on the Minor Elements and their Relation to Plant and Animal Nutrition*.

The First Edition of this *Bibliography* was published in August, 1936, the Second in November, 1936, and the Third, the last complete edition, in February, 1939. Subsequently, the First Supplement was published in April, 1940; the Second, April, 1941; the Third, May, 1942; the Fourth in June, 1943; and the Fifth in July, 1944.

The latest publication in this series, the Sixth Supplement, contains 744 abstracts, which include 97 crops and 53 elements. There are 1,056 authors listed. Complete indices are provided, including an element index, a botanical index, an author index, and an index to abstracts dealing with animal nutrition.

October Cotton Report

A 1945 cotton crop for the United States of 9,779,000 of 500 pounds gross weight is forecast by the Crop Reporting Board, based upon information as of October 1. This is a decrease of 247,000 bales or 2.5 per cent below the forecast as of September 1 and compares with 12,230,000 bales produced in 1944 and the ten (1934-43) year average of 12,293,000 bales. Lint yield per acre for the United States, computed at 260.7 pounds, is 32.8 pounds below last year's record yield but 29.7 pounds above the 10-year (1934-43) average.

The crop is extremely late and the per cent ginned to date is near a record low. In the

northern half of the Cotton Belt plant growth is unusually large and foliage is heavy, delaying opening and increasing potential damage in case of early frost.

No estimate of cottonseed production will be made until December. However, if the ratio of lint to cottonseed is the same as the average for the past five years, production of cottonseed would be 4,030,000 tons.

The Bureau of the Census reports that 2,176,023 bales of cotton were ginned from the crop of 1945 prior to October 1, compared with 3,988,150 bales for 1944 and 5,749,745 bales for 1943.

STATE	PRODUCTION (Ginnings) ¹ 500 lb. gross wt. bales		
	Average 1934-1943 Thous. bales	1944 Thous. bales	1945 Crop Indicated Oct. 1 Thous. bales
Missouri.....	348	411	200
Virginia.....	28	29	22
North Carolina.....	604	710	430
South Carolina.....	755	864	635
Georgia.....	972	810	615
Florida.....	24	13	8
Tennessee.....	498	562	485
Alabama.....	1,010	1,006	940
Mississippi.....	1,677	1,937	1,670
Arkansas.....	1,322	1,394	1,300
Louisiana.....	643	620	420
Oklahoma.....	565	634	390
Texas.....	3,112	2,646	2,000
New Mexico.....	109	116	121
Arizona.....	185	136	135
California.....	424	327	396
All other.....	18	15	12
United States.....	12,293	12,230	9,779
Amer. Egypt ²	34.2	8.8	4.3

¹ Allowances made for interstate movement of seed cotton for ginning. A 500 lb. gross weight bale represents approximately 480 lb. net lint.

² Included in State and United States totals. Grown principally in Arizona, New Mexico, and Texas.

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PHILADELPHIA

(Continued from page 17)

the feed trade. The lower analysis organics are also in limited supply.

Sulphate of Ammonia.—Shipments against contracts are taking practically all the production, so that the producers are unable to build up stocks.

Nitrate of Soda.—While there does not appear to be any surplus, yet supplies are sufficient to meet the demand.

Superphosphates.—Demand is good, and producers seem just about able to keep up with shipment of orders already on the books.

Bone Meal.—This material is in short supply, and many mixers cannot secure all their needs.

Potash.—All types are in demand, although producers have been able to keep up with shipments under contracts.

Castor Pomace.—Still in a tight position, and supply not sufficient to meet the demand.

Legume Green Manuring Plus Fertilizers

Turning under a legume does not always pay unless fertilizers are applied, according to results published in the *Texas Agricultural Experiment Station Annual Report*.

Growing of adapted legumes in cropping systems has greatly increased yields of cotton and corn on the sandy soils in Eastern Texas, and in the Blackland belt, according to the *Report*. But it adds: "On the sandy soils the results show that superphosphate must be used with the legumes to obtain the best results."

"On Lufkin fine sandy loam at College Station," the *Report* continues, "the plowing under of vetch fertilized with superphosphate and potash increased the yield of

cotton about 40 per cent, and unfertilized vetch increased the yield only 6 per cent during the eight years, 1937-44.

"At Nacogdoches, cotton after vetch fertilized with superphosphate potash made an average yield of 286 pounds of lint per acre during the four years, 1941-44; this was 75 per cent more than the yield of 163 pounds of cotton which received no treatment. On the other hand, the plowing under of unfertilized vetch increased it only 40 per cent.

"In a two-year rotation of cotton and corn at Tyler in which vetch was planted as a winter green-manure crop after corn, cotton following vetch fertilized with superphosphate and potash produced about 80 per cent more lint per acre than untreated cotton after corn. The second year, corn following cotton on vetch land produced 27.7 bushels per acre of twice as much as untreated corn after cotton.

"At Denton, in North Texas, the plowing under of fall-planted legumes in early spring has given good increases in the yield of cotton in favorable years, as in 1943, but over a period of years the practice has not been profitable. The winter legumes, as bur clover, hairy vetch, and Austrian winter peas, usually do not make sufficient growth early enough to prepare a good seed bed for an early planted spring crop as cotton or corn. The over-seeding of sweetclover in the spring on small grain, in rotation with cotton and corn, however, has given good results.

"At Temple, in the Blackland Prairie, cotton in a two-year rotation with Hubam clover (harvested for seed) produced an average yield of 315 pounds of lint per acre during the five years 1940-44, while continuous cotton produced only 165 pounds. In a two-year rotation of corn and Hubam clover (for seed), corn made an average yield of 37.4 bushels, and continuous corn yielded 27.2 bushels."



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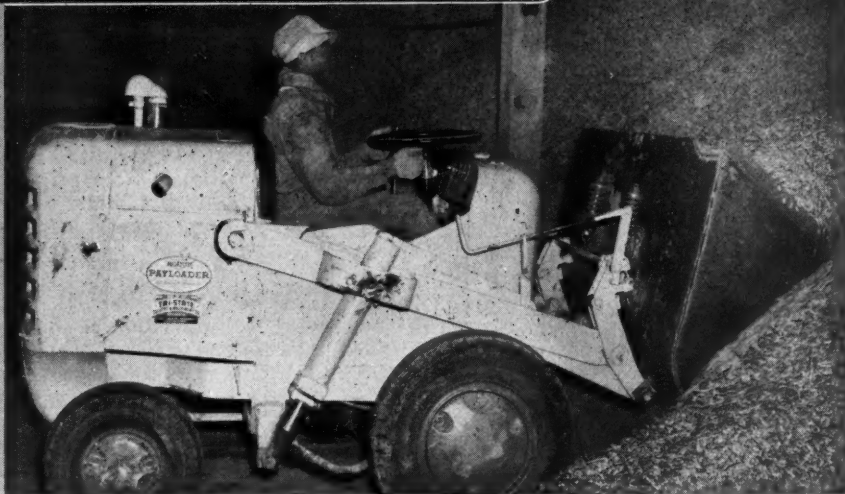
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August Sulphate of Ammonia

The figures of the U. S. Bureau of Mines show that production of by-product sulphate of ammonia totaled 63,259 tons, a decrease of 6 per cent from July. Sales also showed a drop of 5.8 per cent and as a result the stocks on hand at the end of the month increased proportionately to 29,072 tons. It is expected that the final September figures will show a further decline in production as current estimates during the month showed an average daily production of around 1,700 tons compared with a previous daily output of over 2,000 tons.

	Sulphate of Ammonia Tons	Ammonia Liquor Tons NH ₃
Production		
August, 1945.....	63,259	2,251
July, 1945.....	67,327	2,327
August, 1944.....	68,870	2,664
January-August, 1945.....	528,152	18,810
January-August, 1944.....	545,942	21,229
Sales		
August, 1945.....	61,115	2,095
July, 1945.....	64,870	2,033
August, 1944.....	64,470	2,540
January-August, 1945.....	568,350	17,627
January-August, 1944.....	493,681	20,386
Stocks on Hand		
August 31, 1945.....	29,072	810
July 31, 1945.....	27,043	822
August 31, 1944.....	79,462	631

Food Energies in Relation to Agriculture

More than one thousand pages are encompassed in a book entitled *Bioenergetics and Growth*, of which Samuel Brody is author. The book records the findings of research workers in this field, working at the Missouri Agricultural Experiment Station. The project is sponsored by the Herman Frasch Foundation.

In a foreword, Dr. M. F. Miller, director of the Station says: "The major purpose of these investigations was to make a comparative study of the energetic efficiencies of agricultural processes, such as those concerned in the production of meat, milk, eggs, and muscular work, along with factors influencing these efficiencies."

The Frasch Foundation and its technical

adviser, The American Chemical Society, through its trustee, The United States Trust Company of New York, was represented by Dr. R. W. Thatcher, president of Massachusetts State College of Agriculture, a distinguished chemist, who formulated most of the plans of the research project. Following the death of Dr. Thatcher, Dr. F. I. Sievers, Director of the Agricultural Experiment Station of Massachusetts, first took over the work, followed later by Dr. H. R. Kaybill of Purdue University, who organized the plan through which the book was published.

The publication is an important authoritative report of research in a field in which too little is known and provides an example of how funds from private interests can be employed to further research work of the agricultural experiment stations.

Watch pH of Soil for Best Results

The utilization of soil phosphate by both field and pasture plants depends to some extent upon the acidity of the soil. For this reason, Dr. Roy L. Donahue, associate professor of agronomy for the Texas A. and M. College, is recommending to farm unit test demonstrators that they ask their county agricultural agents of the Extension Service to test the acidity, or pH value, of their soil. Most county agents now have equipment to do this.

Dr. Donahue explains that phosphate is most efficient on soils which test out between pH 6 and 7. At this acidity, the greatest amount of nutrients is available to the plant rather than locked up in the soil. Most East Texas soils, he says, have a pH between 5 and 6.5. When the pH value of soil drops below six, lime should be applied before phosphate for legumes, Dr. Donahue recommends. County agricultural agents will advise farmers on the amount of lime which should be applied.

Here are other bits of what Dr. Donahue calls "East Texas phosphate wisdom": The key to good pastures and to good livestock development is phosphate plus clovers. Phosphate is the first limiting factor in the estab-



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lishment of white Dutch, hop, and Persian clovers. About 100 pounds of 20 per cent phosphate per acre per year should be used on clovers in pastures and meadows. When TVA phosphate is used, about 50 pounds per acre per year is best. The phosphate should be placed about one-half inch deep for greatest efficiency.

Proof of the value of phosphate on hubam clover recently was found in the experience of T. B. Graves, Mills County demonstrator, who used 46 per cent superphosphate. The fertilized plot yielded 5,328 pounds of hay and 200 pounds of seed per acre. From the same size untreated plot he harvested 1,000 pounds of hay and 14 pounds of seed. Dr. J. F. Fudge, chief of the division of chemistry for the Texas Agricultural Experiment Station and state chemist, has been analyzing buffalo grass on the Graves farm. During the three years he has made analyses the phosphate content of the treated buffalo grass has been double that of the unfertilized grass. Donahue says these results have important implications for the livestock industry.

—Texas Extension Service.

Fertilizer Increases Arkansas Oat Crop

Oats are on the increase in southeast Arkansas. A part of the increase is due to the shortage of farm labor, which has caused most farmers to change cropping systems. With modern equipment, oats can be produced and harvested with fewer man hours than most other crops, and once the average farmer starts producing them he hesitates to go back to the original acreage of corn and cotton.

In St. Francis County, only 400 acres were seeded in 1940 as compared to 18,000 acres this year, according to H. S. Hinson, former county agent. Monroe County Agent A. C. Smith reported an increase from 1,400 acres in 1936 to 12,000 acres the past winter and spring; and Chicot County Agent E. Leon Thurman, an increase from 2,000 to 29,000 acres. County agents in most of the other 17 southeast Arkansas counties report similar increases.

Farmers throughout the district are fol-

lowing improved practices—such as good seedbed preparation, early planting, good drainage, and fertilization—recommended by the University of Arkansas College of Agriculture Experiment Station.

W. R. Tuck, South Arkansas County, told W. F. Wright, county agent, he obtained 15 more bushels per acre from oats fertilized with 100 pounds of ammonium nitrate than from unfertilized oats. J. O. Millholland, Lake Village, reported a yield of 87 bushels per acre this spring, a large portion of which he attributed to the use of 100 pounds of nitrate of soda per acre. Manso Austin, Route 2, Monticello, in cooperation with James Hart, Drew County agent, kept a record on fertilized and unfertilized plots this spring and found a 100 per cent increase in yields as a result of a side-dressing of nitrate. Application of phosphate at seeding time is also proving a good practice.

Oat producers are keeping up-to-date on improved varieties. New varieties developed at the Experiment Station are released to farmers for the purpose of increasing seed. Last spring, Max Sansing, Phillips County, reproduced 3,250 pounds of seed from 115 pounds of the new Traveler oats, released in 1943, D. D. Dodd, county agent, said.

The oat acreage will again increase this fall for harvest next spring, discussions with producers indicate; and the acreage is expected to continue high, although the war may have been responsible for some of the present increase. In the rice area, drying equipment and storage facilities are helping

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build the oat production industry—already a million dollar enterprise in several counties. In addition to being grown for commercial purposes, the oat crop is being used for livestock feed in many cases. Fall oats overseeded with lespedeza give an enormous amount of feed, and the practice fits well into livestock production.—*Arkansas Agr. Extension Service News item.*

Modern pH and Chlorine Control

A completely revised edition of the Taylor combination handbook and catalog, contains both simple and technical explanations of the meaning of pH control; specific discussions of the application of pH, chlorine and phosphate control to 35 industries; the precautions to be observed in making determinations; and descriptions of all Taylor outfits, including 8 new sets. A copy will be sent free on request to W. A. Taylor & Co., 7300 York Road, Baltimore 4, Md.

NAM PROTESTS COMPULSORY LICENSING OF PATENTS

(Continued from page 16)

Suppressed Inventions Idea Declared Imaginary

Advocates of compulsory licensing of patents contend that industry suppresses inventions and that, therefore, the legislation they seek is necessary.

"The popular impression that patented inventions are suppressed is a figment of the imagination as there is no evidence that such is the case," Mr. Dearborn stated. "No one so far has cited a case of a suppressed invention. There are doubtless many patents which are not used. There are many reasons why a patented invention may not be used, but non-use is different from wilful suppression. Some of the reasons why an invention may not be used are: (1) there may be no immediate market; (2) there may be a better or cheaper method for achieving the same purpose; (3) capital may not be available for immediate commercialization; (4) time

and effort may be required to perfect a new product before putting it on the market.

"The United States patent system is far from perfect, but the fundamental idea behind it is sound. We cannot maintain and advance our industrial supremacy if we depart from it. However, there are dangerous proposals for radical change, almost invariably based on false assumptions which have been so often repeated that they are accepted as truths."

Industry Backs Constructive Changes

Industry, through the National Association of Manufacturers, is backing a program for constructive changes in the patent system. Among the revisions which NAM has long advocated are:

1. The public recording in the Patent Office of contracts relating to patents in so far as the public interest is affected. This would combat illegal cartels by facilitating Government investigation of the practices involved and enable the Government to determine whether they are contrary to public policy, or in violation of anti-trust laws, or in conflict with international policy.

2. Limiting the life of a patent to a period of not more than twenty years after the application therefore has been filed, but

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When Boron deficiencies are found, follow the recommendations of local County Agents or State Experiment Stations.

Information and references available on request.

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See Page 4



keeping the term of a patent at seventeen years.

3. Providing the Patent Office with more adequate facilities and additional personnel so that it may employ and retain scientists of outstanding ability in sufficient numbers to make a more complete examination of every patent application.

4. Simplification of accounting proceedings to reduce the cost of patent litigation.

5. Reduction of the cost and simplification of the procedure of patent litigation.

NEW JERSEY SOILS

(Continued from page 11)

Other Trace Elements

Strong evidence has been found that the Sassafras, Hagerstown, Merrimac, Gloucester, and Lakewood soils are in serious need of magnesium, whereas the Dover, Whippany, Lansdale, Bermudian, and Fox are not. The other soils studies occupy intermediate positions with respect to this element.

Applications of radioactive material to the soil on which beets were being grown had no noticeable effect on the crop. The extent to which zinc, manganese, and copper are required to be supplied for maximum crop yields, or the degree to which they can be made to serve as crop stimulants, remains to be determined, but preliminary studies are under way.

The Role of Sand-Size Soil Particles

Certain essential plant nutrient cations, such as calcium, potassium, and magnesium, are held tightly or adsorbed on the surface of very small or colloidal soil particles. When plant roots come in contact with these colloidal particles, such adsorbed cations are released in a base-exchange process and are absorbed by the roots. This process provides an important source of plant nutrients.

Small particles have been considered to be chiefly concerned in this process because of their relatively large exposed surface area per unit weight as compared with that of large particles.

Recent experiments under controlled sand-culture conditions have shown, however,

that certain types of particles separated from the soil and large enough to be classed as sand were able to hold and to release to plant roots unexpectedly large amounts of calcium, amounts which compared favorably with those supplied by very small soil particles. These sand-size particles apparently possessed a large total surface area because of their porous structure and differed greatly from ordinary solid particles which do not possess the property of adsorption to any considerable degree.

These results show that soil particles as large as sand, and hitherto considered relatively unimportant, may in some soils supply appreciable amounts of essential nutrients to plants. This fact may be important in the conservation and use by crop plants of fertilizers applied to the soil.

Ammonium Nitrate Tested

By reason of its growing economic importance as a fertilizer, special attention was paid to ammonium nitrate, a careful comparison of this material with other forms of nitrogen being made on pasture grasses. The increased yields produced by its use were about the same as those resulting from the application of sulphate of ammonia and urea, but not quite so large as were obtained with the same amount of nitrogen in the form of nitrate of soda. Similar tests of liquid ammonia dissolved in water showed that it tended to burn the grass, no matter whether applied during the middle of the day



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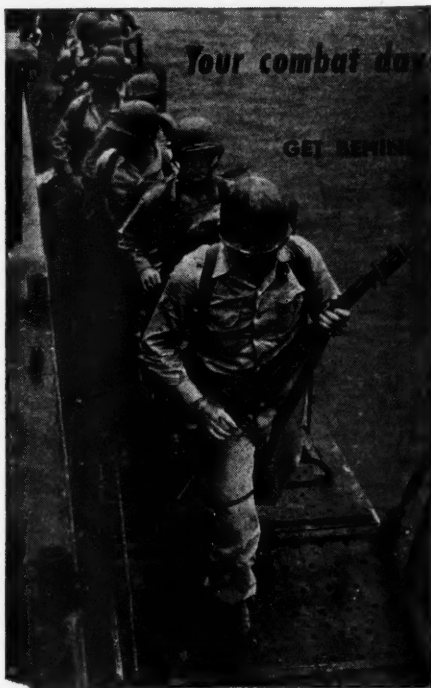
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or in the evening, and that its effect on yield was relatively very small.

Fertilizer in Water

Recent findings favoring the application of fertilizer in water to vegetable crops led our vegetable department to design a machine for this purpose. Successful use of this distributor on large commercial fields brought requests for a similar device that would be suitable for small plots. For this purpose a 4-gallon tank was mounted on a two-wheel sulky similar to a large wheel hoe. The liquid flows through a tube to a cultivator tooth, which applies it alongside the row. The equipment is practical for areas up to one acre.

Equipment was built to apply regular fertilizer mixtures. The fertilizer is placed in the tank and circulated through a rotary pump which keeps it in suspension. Pipes are placed in the barrel in such a manner that the movement of solution prevents residues from settling out, so that the residue is applied uniformly with the solution. A gasoline motor drives the pump. Mounted on a tractor, the pump may be driven from the power take-off. This equipment eliminates the need for cistern and tanks.

Equipment was also built to be mounted on a plow or subsoiler beam to apply fertilizer solutions on the bottom of the furrow or in the subsoil. One season's observations of the use of this equipment indicate that this method of application may have much use on vegetable farms in the future.

Sowing seed during dry weather always results in spotty germination. We have found that water or starter solution applied with the seed greatly improves germination, resulting in much more uniform stands. A commercial concern now offers equipment to apply this liquid as the seed is sown. This is the result of work in our vegetable department.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

of THE AMERICAN FERTILIZER, published bi-weekly at Philadelphia, Pa., for October 1, 1945.

STATE OF PENNSYLVANIA }
COUNTY OF PHILADELPHIA } ss.

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared A. A. Ware, who, having been duly sworn according to law, deposes and says that he is the editor of THE AMERICAN FERTILIZER, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

Name of	Post-office Address
Publisher, Ware Bros. Company,	1330 Vine St., Philadelphia, Pa.
Editor, A. A. Ware,	1330 Vine St., Philadelphia, Pa.
Managing Editor, None.	
Business Manager, A. A. Ware,	1330 Vine St., Philadelphia, Pa.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

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5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.)

A. A. WARE, Editor.

Sworn to and subscribed before me this 6th day of October, 1945.

A. M. BLANCHE,
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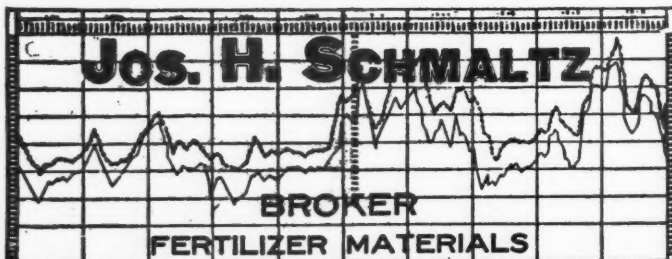
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